35532 管體耦合器

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一、申請案號數：六九二六二〇六號
（由六九一一四二六號改請）
二、創作之名稱：管體耦合器
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四、申請之日期：六十九年五月廿二日
五、請求專利部份：

1.一種管體耦合器包含一軀體構件，該軀體構件俱有一外部螺紋與一軸間佈列而朝一孔隙收斂之內壁以將欲被緊緊之管體之末端容納於耦合器之中，一螺母構件以裝置於該管體之上，該螺母構件且俱有螺紋以適合軀體構件之螺紋，該耦合器另分別包含可變形之前套圈與後套圈，這些套圈係裝置於軀體構件與螺母構件之間之管體之上，該前套圈俱有一外部逐漸變細之前導末端以與軀體構件之收斂壁接觸，該前套圈另於施曳末端俱有一向內逐漸變尖之開口6，該後套圈則俱有一外部逐漸變細之前導端以與前套圈之變尖開口接觸，該後套圈另俱有一外部逐漸變細之拖曳末端，螺母構件於螺紋內部末端處俱有一環形斜面以與後套圈之拖曳末端接觸，該軀體構件之收斂內壁，該前套圈之逐漸變細之開口與該螺母構件之環形斜面均俱有直線之縱側面，而該前套圈之前導端，該後套圈之前導端與該後套圈之拖曳端均俱有凸出之縱側面，因此每一凸出而逐漸變細之表面適合於其個別之直線而逐漸變細之表面而形成直線之接觸。

2.一種管體耦合器如請求專利部份第1項所述，其中該軀體構件之收斂內壁對軸之角度爲12度與20度之間。

3.一種管體耦合器如請求專利部份第2項所述，其中該軀體構件之收斂內壁對軸之角度爲15度。

4.一種管體耦合器如請求專利部份第1至第項3之中任何一項所述，其中該前套圈之逐漸尖之開口對軸之角度爲45度。

5.一種管體耦合器如請求專利部份第1至第4項之中任何一項所述，其中該螺母構件之斜面對軸之角度爲75度至80度之間。

6.一種管體耦合器如請求專利部份第5項所述，其中該螺母構件之斜面對軸之角度爲77度。

7.一種管體耦合器如請求專利部份第1至第6項之中任何一項所述，其中該前套圈於其拖曳末端俱有一較厚之部位圍繞於逐漸變尖之開口。

8.一種管體耦合器如請求專利部份第7項所述，其中該較厚部位係自凸出而逐漸變細之前導端之較粗末端開始增加厚度，因此該較厚部位俱有一種圓柱形之外表面。

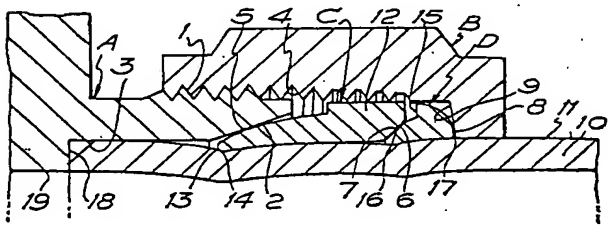
9.一種管體耦合器如請求專利部份第1至第8項之中任何一項所述，其中該前套圈之前導端俱有一扁平環形末端面，而該末端面之內緣則適合卡緊於管體之內。

10.一種管體耦合器如請求專利部份第1至第9項之中任何一項所述，其中該後套圈於前導端之較粗末端與拖曳端之較粗末端之間俱有一階梯（Step up）。

11.一種管體耦合器如請求專利部份第10項所述，其中該後套圈之前導端係自該階梯以曲線方式延挿於一邊緣，而該邊緣適合卡緊於管體之內。

12.一種管體耦合器如請求專利部份第1至第11項之中任何一項所述，其中該軀體構件之孔隙係由一環形突肩以一較小之孔隙連接之。

13.一種管體耦合器實質如此處依據所附圖件所說明者。



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TITLE: PIPE COUPLINGS

TRUE AND FIRST INVENTOR: GEOFFREY ROBERT FAIRNIE

Corresponding to British Patent Application 7917943

filed 23rd May 1979.

This invention relates to pipe couplings of the type comprising a body member having an external screw-thread and an axially-disposed internal wall converging towards a bore for receiving an end of a pipe to be secured in the coupling, a nut member for mounting on a pipe and having a screw-thread fitting the screw-thread on the body member, and front and rear deformable ferrules for mounting on a pipe between the body and nut members, the front ferrule having an externally tapered leading end for contacting the converging wall in the body member and an inwardly tapering mouth at the trailing end, the rear ferrule having an externally tapered leading end for contacting the tapering mouth of the front ferrule and an externally tapered trailing end, and the nut member having an annular bevel at the inner end of the screw-thread for contacting the trailing end of the rear ferrule, whereby, when the body and nut members are in position around a pipe with the ferrules therebetween, screwing of the nut and body members together forces the leading end of the front ferrule into the convergent space between

the converging wall in the body member and the outer surface of the pipe, and thereby compresses radially the leading end of the front ferrule so that it grips the pipe, and the leading end of the rear ferrule is forced into the tapering mouth in the trailing end of the front ferrule, and thereby compresses radially the leading end of the rear ferrule so that it too grips the pipe. The angle of the tapering mouth of the front ferrule is appreciably greater than the angle of the converging internal wall of the body member, so that the leading end of the front ferrule grips the pipe before the leading end of the rear ferrule, the rise in the effort required to tighten the nut and body members when the leading end of the rear ferrule grips the pipe being an indication that the leading end of the front ferrule is gripping the pipe sufficiently to provide a satisfactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling. Such a coupling will be called hereinafter "a coupling of the type referred to".

As the leading end of the front ferrule

begins to grip the pipe, friction between the front ferrule and the body member, also between the rear ferrule and the front ferrule, and between the nut member and the rear ferrule increases and continues to increase as the grip increases, and may become so appreciable by the stage at which the leading end of the rear ferrule begins to grip the pipe that the rise in the effort required to tighten the nut and body members is not substantial enough to serve as an indication that the leading end of the rear ferrule is beginning to grip the pipe.

The object of the present invention, therefore, is to reduce friction in a coupling of the type referred to.

According to the present invention, in a coupling of the type referred to the converging internal wall of the body member, the tapering mouth in the front ferrule, and the annular bevel in the nut member all have straight longitudinal profiles, while the leading end of the front ferrule, the leading end of the rear ferrule, and the trailing end of the rear ferrule all have convex longitudinal profiles such that each convexly tapering

surface initially fits into its respective straight tapering surface to make line contact therewith intermediate of its ends.

Thus, there is not anywhere, between the body member and the front ferrule, between the front ferrule and the rear ferrule, or between the rear ferrule and the nut member, at any time while the nut and body members are being tightened together,any appreciable surface contact to create high friction or increase friction, nor any possibility of a circumferential edge being brought into contact with a surface. Therefore, the rise in effort required to tighten the nut and body members when the leading end of the rear ferrule grips the pipe will be significant and will, accordingly, afford a very clear indication that the leading end of the front ferrule is gripping the pipe sufficiently to provide a satisfactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling.

The convexly tapering surfaces can be regarded as executing rolling sliding movement with respect to the respective straight tapering

surfaces as the nut and body members are tightened. Alternatively, the longitudinal sections of the ferrules can be regarded as rocking inwardly with respect to the axis from their trailing ends to their leading ends.

The angle of the converging internal wall of the body member is preferably between 12^{o} and 20^{o} to the axis, more particularly 15^{o} , the angle of the tapering mouth in the front ferrule is preferably 45^{o} to the axis, and the angle of the bevel in the nut member is preferably between 75^{o} to 80^{o} to the axis, more particularly 77^{o}.

The front ferrule preferably has a thicker portion around the tapering mouth in its trailing end, to afford increased resistance to stretching when the leading end of the rear ferrule is pushed into the tapering mouth in the front ferrule, the thicker portion preferably being stepped up from the larger end of the convexly tapering leading end, and the thicker portion preferably has a cylindrical outer surface. The leading end of the front ferrule preferably has a flat annular end face the inner edge of which is adapted to

bite into the pipe. The rear ferrule preferably has a step up between the larger end of the leading end and the larger end of the trailing end, and the leading end of the rear ferrule preferably curves from the step to an edge which is adapted to bite into the pipe. The trailing end of the rear ferrule also preferably curves from the step to an edge, but this rear edge does not bite into the pipe.

The bore in the body member is preferably connected by an annular shoulder with a smaller bore, the annular shoulder serving as a stop for an inserted pipe.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which

Figures 1 to 4 are all half-sectional side elevations of respectively a body member, a front ferrule, a rear ferrule, and a nut member that together form a pipe coupling in accordance with the invention;

Figure 5 is a longitudinal section to a larger scale of one half of the coupling as

initially assembled and with a pipe inserted; and

Figure 6 corresponds to Figure 5 but shows the coupling when the nut and body members have been screwed together until both ferrules grip the pipe.

The pipe coupling shown in the drawings comprises a body member A, having an external screw-thread 1 and an axially disposed internal wall 2 converging towards a bore 3 for receiving an end of a pipe to be secured in the coupling, a nut member B for mounting on a pipe and having a screw-thread 4 fitting the screw-thread 1 on the body member A, and front and rear deformable ferrules C, D, respectively, for mounting on a pipe between the body and nut members, the front ferrule C having an externally tapered leading end 5 for contacting the converging wall 2 in the body member A and an inwardly tapering mouth 6 at the trailing end, the rear ferrule D having an externally tapered leading end 7 for contacting the tapering mouth of the front ferrule and an externally tapered trailing end 8, and the nut member B having an annular bevel 9 at the inner end of the

screw-thread 4 for contacting the trailing end of the rear ferrule, whereby, when the body and nut members A, B are in position around a pipe 10 (Figure 5) with the ferrules C, D, therebetween, screwing of the nut and body members together (Figure 6) forces the leading end 5 of the front ferrule C into the convergent space between the converging wall 2 in the body member A and the outer surface 11 of the pipe, and thereby compresses radially the leading end of the front ferrule so that it grips the pipe, and the leading end 7 of the rear ferrule D is forced into the tapering mouth 6 in the trailing end of the front ferrule C, and thereby compresses radially the leading end 7 of the rear ferrule so that it too grips the pipe. The angle of the tapering mouth 6 of the front ferrule C is appreciably greater than the angle of the converging internal wall 2 of the body member A, so that the leading end 5 of the front ferrule grips the pipe 10 before the leading end 7 of the rear ferrule, the rise in the effort required to tighten the nut and body members when the leading end 7 of the rear ferrule grips the

pipe being an indication that the leading end 5 of the front ferrule is gripping the pipe sufficiently to provide a satisfactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling.

In accordance with the invention, the converging internal wall 2 of the body member A, the tapering mouth 6 in the front ferrule C, and the annular bevel 9 in the nut member B all have straight longitudinal profiles, while the leading end 5 of the front ferrule C, the leading end 7 of the rear ferrule D, and the trailing end 8 of the rear ferrule all have convex longitudinal profiles such that each convexly tapering surface initially fits into its respective straight tapering surface to make line contact therewith intermediate its ends. Thus, there is not anywhere, between the body member A and the front ferrule C, between the front ferrule and the rear ferrule D, or between the rear ferrule and the nut member B, at any time while the nut and body members are being tightened together, any appreciable surface contact to create high

friction or increase friction, nor any possibility of a circumferential edge being brought into contact with a surface. Therefore, the rise in effort required to tighten the nut and body members A, B when the leading end 7 of the rear ferrule D grips the pipe will be significant and will, accordingly, afford a very clear indication that the leading end 5 of the front ferrule C is gripping the pipe 10 sufficiently to provide a satisfactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling.

The convexly tapering surfaces 5, 7 and 8 can be regarded as executing rolling sliding movement with respect to the respective straight tapering surfaces 2, 6 and 9 as the nut and body members A, B are tightened. Alternatively, the longitudinal sections of the ferrules C, D can be regarded as rocking inwardly with respect to the axis from their trailing ends to their leading ends.

The angle of the converging internal wall 2 of the body member A is 15^{o} to the axis, the angle of the tapering mouth 6 in

the front ferrule C is 45° to the axis, and the angle of the bevel 9 in the nut member B is 77° to the axis.

The front ferrule C has a thicker portion 12 around the tapering mouth 6 in its trailing end, to afford increased resistance to stretching when the leading end 7 of the rear ferrule D is pushed into the tapering mouth, the thicker portion being stepped up from the larger end of the convexly tapering leading end 5, and the thicker portion having a cylindrical outer surface. The leading end 5 of the front ferrule C has a flat annular end face 13 the inner edge 14 of which is adapted to bite into the pipe 10. The rear ferrule D has a step up 15 between the larger end of the leading end 7 and the larger end of the trailing end 8, and the leading end 7 curves from the step 15 to an edge 16 which is adapted to bite into the pipe 10. The trailing end 8 of the rear ferrule D also curves from the step 15 to an edge 17, but this rear edge does not bite into the pipe.

The bore 3 in the body member A is connected by an annular shoulder 18 with a

smaller bore 19 (which preferably has, as shown, the same diameter as the bore of the pipe 10), the annular shoulder serving as a stop for the inserted pipe.

CLAIMS

1. A pipe coupling comprising a body member having an external screw-thread and an axially-disposed internal wall converging towards a bore for receiving an end of a pipe to be secured in the coupling, a nut member for mounting on a pipe and having a screw-thread fitting the screw-thread on the body member, and front and rear deformable ferrules for mounting on a pipe between the body and nut members, the front ferrule having an externally tapered leading end for contacting the converging wall in the body member and an inwardly tapering mouth at the trailing end, the rear ferrule having an externally tapered leading end for contacting the tapering mouth of the front ferrule and an externally tapered trailing end, and the nut member having an annular bevel at the inner end of the screw-thread for contacting the trailing end of the rear ferrule, the converging internal wall of the body member, the tapering mouth in the front ferrule, and the annular bevel in the nut member all having straight longitudinal profiles, while the leading end of the front ferrule, the leading end of the rear ferrule, and the trailing end

of the rear ferrule, all have convex longitudinal profiles such that each convexly tapering surface initially fits into its respective straight tapering surface to make line contact therewith intermediate of its ends.

2. A pipe coupling as in Claim 1, wherein the angle of the converging internal wall of the body member is between 12° and 20° to the axis.

3. A pipe coupling as in Claim 2, wherein the angle of the converging internal wall of the body member is 15° to the axis.

4. A pipe coupling as in any one of Claims 1 to 3, wherein the angle of the tapering mouth in the front ferrule is 45° to the axis.

5. A pipe coupling as in any one of Claims 1 to 4, wherein the angle of the bevel in the nut member is between 75° to 80° to the axis.

6. A pipe coupling as in Claim 5, wherein the angle of the bevel in the nut member is 77° to the axis.

7. A pipe coupling as in any one of Claims 1 to 6, wherein the front ferrule has

a thicker portion around the tapering mouth in its trailing end.

8. A pipe coupling as in Claim 7, wherein the thicker portion is stepped up from the larger end of the convexly tapering leading end, and the thicker portion has a cylindrical outer surface.

9. A pipe coupling as in any one of Claims 1 to 8, wherein the leading end of the front ferrule has a flat annular end face the inner edge of which is adapted to bite into the pipe.

10. A pipe coupling as in any one of Claims 1 to 9, wherein the rear ferrule has a step up between the larger end of the leading end and larger end of the trailing end.

11. A pipe coupling as in Claim 10, wherein the leading end of the rear ferrule curves from the step to an edge which is adapted to bite into the pipe.

12. A pipe coupling as in any one of Claims 1 to 11, wherein the bore in the body member is connected by an annular shoulder with a smaller bore.

13. A pipe coupling substantially as hereinbefore described with reference to the accompanying drawings.

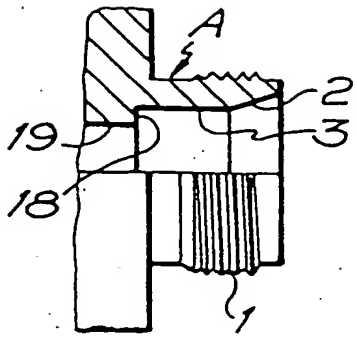

FIG. 1

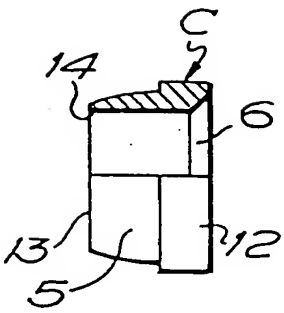

FIG. 2

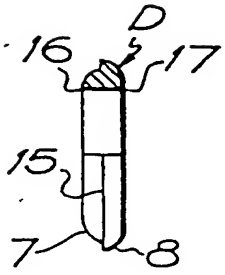

FIG. 3

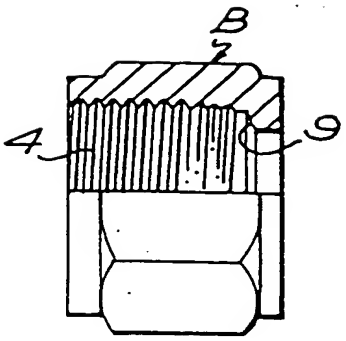

FIG. 4

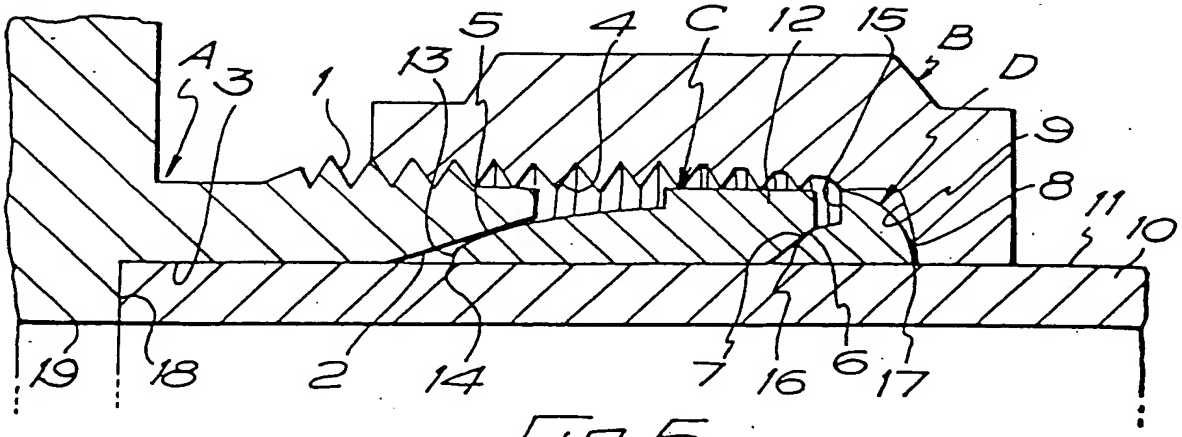

FIG. 5

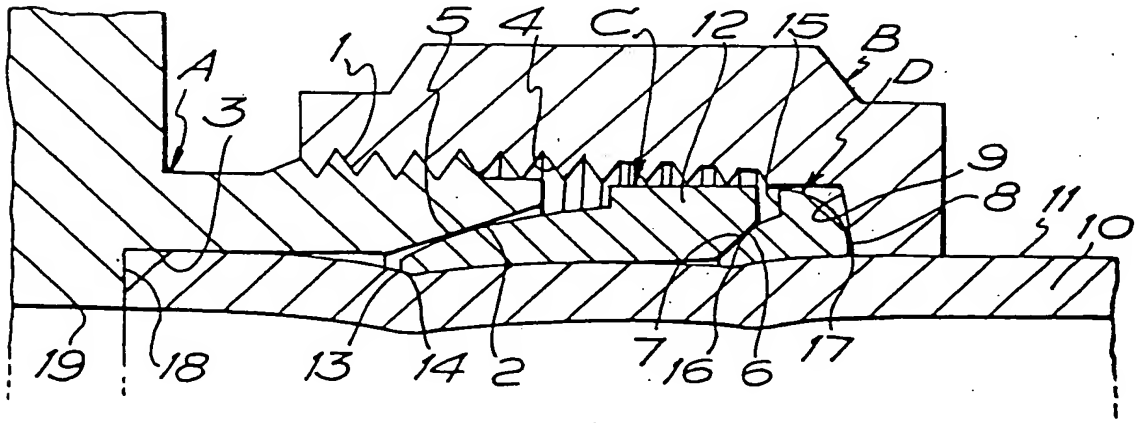

FIG. 6